



Claims

1. An apparatus for drainage of a wound or surgical site of a human or animal fits anatomically and passes from inside the wound or surgical site percutaneously and extends externally for accumulation of fluids, the apparatus for drainage comprises:

a plurality of fibers each having an internal end, an external end and a middle there between, each fiber elongate with a thickness and a length wherein its thickness is substantially less than its length for flexibility, the plurality of fibers having gathered together external ends leaving the internal ends unrestrained to spread in the wound or surgical site;

an external collector positioned in fluid communication with the gathered together external ends for accumulating bodily fluid guided along and amongst the one or more of the plurality of fibers from the internal ends along the middle and to the gathered together external ends during drainage of fluid from inside the wound or surgical site, and

the plurality of fibers flexible so that at their unrestrained internal ends each fiber is able to spread divergently of the other fibers while inside the wound or surgical site.

2. The apparatus of claim 1 with a source of vacuum in fluid communication with and connected to actively draw fluid from the external collector positioned in fluid communication with the gathered together external ends and over the wound or surgical site.

3. The apparatus of claim 1 with each of the plurality of the fibers selected from the group consisting essentially of filaments, strings, strands, hollow fibers or any combination thereof.

4. The apparatus of claim 1 with the plurality of fibers made from a biocompatible material selected from the group consisting essentially of polymers, cellulose, natural substances or any combination thereof.

5. The apparatus of claim 4 with the biocompatible material being bio-absorbable.
6. The apparatus of claim 1 with the plurality of fibers including an anticoagulant for resisting the clotting of fluid passing there along, about and among.
7. The apparatus of claim 1 with the plurality of fibers including an anti-microbial for deterring the passing of microbes there along, about and among.
8. The apparatus of claim 2 with the source of vacuum being less than atmospheric and with a regulator connected between the source of vacuum and the external collector to control the amount of vacuum applied to the gathered together external ends.
9. A method for drainage of a wound or surgical site of a human or animal, the method includes apparatus that fits anatomically and passes from inside the wound or surgical site percutaneously and extends externally for accumulation of fluids, the method for drainage including the steps of:
 - providing a plurality of fibers each having an internal end, an external end and a middle there between, each fiber elongate with a thickness and a length wherein its thickness is substantially less than its length for flexibility;
 - gathering the plurality of fibers together near their external ends;
 - allowing the internal ends to remain unrestrained for spreading within the wound or surgical site;
 - guiding bodily fluid along and amongst the fibers from the internal ends along the middle and to the gathered together external ends during drainage of fluid from a wound or surgical site;
 - positioning an external collector in fluid communication with the gathered together external ends and percutaneously covering the wound or surgical site opening;
 - accumulating bodily fluid in the external collector from plurality of fibers at their unrestrained internal ends which are inside the wound or surgical site, and
 - spreading divergently at least the internal ends for accumulating bodily fluid and for guiding bodily fluid along and amongst the fibers from the internal ends along the middle and to the gathered together external ends during drainage.

10. The method of claim 9 with the steps of connecting in fluid communication a source of vacuum to the external collector and actively drawing fluid from the external collector, and actively drawing fluid from the external collector positioned in fluid communication with the gathered together external ends.

11. The method of claim 9 with the step of using flexible fibers for draining by selecting the plurality of fibers from the group consisting essentially of filaments, strings, strands, hollow fibers or any combination thereof for use in draining.

12. The method of claim 9 with the step of using flexible fibers made from a biocompatible material selected from the group consisting essentially of polymers, cellulose, natural substances or any combination thereof for draining.

13. The method of claim 12 with the step of using biocompatible material being bio-absorbable during the period of draining for the plurality of fibers.

14. The method of claim 9 with the step of including an anticoagulant on the plurality of fibers for resisting the clotting of fluid passing along, among and about the plurality of fibers during draining.

15. The method of claim 9 with the step of including an anti-microbial on the plurality of fibers for deterring the passing of microbes along, among and about the plurality of fibers during draining.

16. The method of claim 10 with the step of controlling the source of vacuum with a regulator connected between the source of vacuum and the external collector for adjusting vacuum applied during draining.

17. The method of claim 9 with the step of introducing the plurality of fibers by the steps of constraining at least the internal ends and the middle with an introducer, and removing the introducer while leaving at least the internal ends of the plurality of fibers inside the wound or surgical site for guiding drainage.

18. The method of claims 17 with the step of spreading divergently the internal ends inside the wound or surgical site.

19. The method of claim 17 with the step of holding the external collector during placement of the plurality of fibers within the introducer in the wound or surgical site.

20. The method of claim 17 with the step of allowing the plurality of fibers in the middle to flex and shift relative to one another so that the cross section thereof approximates the cross section of the surgical site percutaneous incision through which the middle passes for guiding drainage during healing.

21. A method of manufacture of an apparatus for drainage of a wound or surgical site of a human or animal so the apparatus fits anatomically and passes from inside the wound or surgical site percutaneously and extends externally for accumulation of fluids, the method for manufacture having the steps of:

accumulating a plurality of fibers each having an internal end, an external end and a middle there between in a loose bundle; gathering together each fiber elongate with a thickness and a length wherein its thickness is substantially less than its length for flexibility at their external ends while leaving the internal ends unrestrained, and

positioning an external collector in fluid communication with the gathered together external ends for accumulating bodily fluid guided along, about and amongst the fibers from the internal ends along the middle and to the gathered together external ends during drainage of fluid from inside the wound or surgical site.

22. The method of claim 21 with the step of assembling the apparatus for drainage movably within an the introducer.